AbstractID: 7952 Title: An automatic post-implant needle reconstruction algorithm to characterize and improve the implant planning technique

Purpose: We present a method to automatically reconstruct the needles of a post-implant cluster of seeds based on the planning positions that also take into account the possible loss of seeds (migration and/or embolization), and to demonstrate its usefulness for post implant technique characterization.

Methods and materials: A simulated annealing algorithm was developed. The parameter to minimize was chosen as the sum of distances between pre and post implant positions. After many trials, it is shown that the distance criterion holds for nearly all of the clinical cases and that possible problematic situations can be easily spotted before proceeding with the reconstruction. The choice of the cooling scheme, done in three steps, resulted in a quick convergence after some tuning using data previously reconstructed by hand.

Results: Even with nearly 10^{62} configurations, finding the good one is fast. On a 733 MHz Pentium**,** the algorithm takes less than 30 seconds to reconstruct a standard implant and little less than a minute if seed(s) are missing. It has been used on more than 30 cases either immediately after the treatment or 30 days later.

Conclusion: From the results, it was possible to study the needle related displacements of seeds and to have an idea of the importance of the edema. It was also possible to make accurate simulations of seeds implantation from real planning configuration, allowing large comparative study of the numerous seeds models, activity available or even planning methods.